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SUBMERGENCE ANOXIA AND MINERAL HOMEOSTASIS IN TURTLES. Stephen J. Warburton, Jeremy S. Wasser, and Donald C. Jackson, Brown University, Providence RI 02912.

Diving turtles undergo substantial increases in plasma calcium and magnesium during anoxic submergence. Since turtle shell contains large amounts of calcium, magnesium, phosphate, and HCO_3^-, we studied the possible involvement of the shell with anoxic adaptation in *Chrysemys picta bellii* submerged for 12 weeks at 3°C in anoxic water (P_{O_2} < 1 torr). In agreement with previous studies, plasma calcium and magnesium were higher in the anoxic animals than in the control group (Ca-27.0 vs. 2.0 mmol·l^{-1}; Mg-10.8 vs. 1.35 mmol·l^{-1}). Samples of carapace and plastron were less dense in the anoxic group, suggesting loss of mineral (plastron-1.575 vs. 1.603 g·ml^{-1}; carapace-1.581 vs. 1.643 g·ml^{-1}). Shell calcium and phosphate did not appear to change; shell magnesium was reduced in the anoxic group (both plastron and carapace-0.17 vs 0.21 mmol·g^{-1} dry shell weight). Alkaline phosphatase (AlP) and acid phosphatase (AcP) were elevated in the anoxic group (AlP 2.78 vs. 1.38 IU·ml^{-1}; AcP 6.44 vs. 2.57 IU·ml^{-1}) suggesting hormonal involvement in mineral regulation during anoxia. These data suggest the shell composition may be actively regulated to serve as a buffer source during extreme anoxic stress.

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METABOLIC AND ACID-BASE REGULATORY RESPONSES OF IN VITRO TURTLE HEART TO ANOXIA AND ACIDOSIS AT 20 °C. J.S. Wasser, R. Lawler*, K.C. Inman*, E.A. Arendt*, and D.C. Jackson. Brown University, Providence, RI 02912.

We used ^{31}P-NMR spectroscopy to study the responses of self-paced, working turtle hearts during 4 h of either anoxic (pH_e 7.8; n=5) or acidotic (pH_e 7.0; n=4) perfusion, or 1.5 h of combined anoxia/acidosis (pH_e 7.0; n=4) preceded and followed by an oxygenated control perfusion (pH_e 7.8). Control pH_i averaged 7.4 and phosphocreatine (PCr) and ATP peaks were prominent. Anoxia resulted in a 0.2 unit fall in pH_i and a 50% drop in PCr by h 1 after which these values remained constant until recovery. ATP decreased slightly over this period. During acidosis pH_i fell 0.4 units by h 1 and then remained constant until recovery. PCr and ATP both changed little. Combined anoxia/acidosis caused a profound drop in pH_i (to 6.5) and PCr (to undetectable levels) in less than 1 h. pH_e-pH_i was 0.4, 0.0, 0.6, and 0.5 for control, acidotic, anoxic, and anoxic/acidotic hearts respectively. In summary: (1) during anoxia the fall in PCr correlated with the degree of intracellular acidosis; and (2) pH_i was well regulated during acidosis but intracellular acid-base regulation was impaired by anoxia. Supported by NSF DCB8802045 and NRSA 5F32HL07581.

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THE STRUCTURE OF RATHKE'S GLANDS AND A HYPOTHESIS ON THEIR FUNCTION. P.J. Weldon, M.J. Tanner* and M.S. Cannon*. Texas A&M Univ., College Station.

Rathke's glands are paired, muscle ensheathed organs embedded in the ventrolateral aspect of many aquatic chelonians. Secretions from these glands are discharged through foramina in the axillary, inframarginal, and inguinal areas. Chemical analyses of Rathke's gland secretions from marine and freshwater turtles indicate glycoproteins and lipids, including high concentrations of lactic acid. We suggest that this metabolite collects in and is excreted by Rathke's glands. Circulatory components, as demonstrated within and around the glands of the Kemp's ridley sea turtle (Lepidochelys kempi), are hypothesized to impart blood-borne metabolites to the secretions. The distribution of Rathke's glands in aquatic chelonians, and their absence in strictly terrestrial species, is consistent with the proposed function of these organs as regulators of lactic acid. Rathke's glands may accumulate this metabolite during protracted periods of underwater submergence. Supported by grants from H.E.A.R.T. through Carole H. Allen and Sea Grant.

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TRAWL STRESS IN KEMP'S RIDLEY SEA TURTLES. E.K. Stabenau and T.A. Heming. Univ. of Texas, Galveston, and National Marine Fisheries Service, Galveston Laboratory, TX.

Two and three yr old Kemp's ridley sea turtles (Lepidochelys kempi) were trawled in shrimp nets for a maximum of 5 min, as part of the turtle excluder device (TED) certification tests conducted by the National Marine Fisheries Service. Blood samples obtained from the paired cervical sinus, immediately before and after trawling, were analyzed for pH, lactate, sodium, potassium, chloride, bicarbonate, Cco_2 and Pco_2. Blood pH, bicarbonate and Cco_2 decreased 0.37 U, 11.4 mM and 10.8 mM post-trawl, respectively, while Pco_2, lactate and potassium increased 19.7 torr, 8.7 mM and 3.2 mM post-trawl, respectively. Changes in sodium and chloride were not evident. Post-trawl changes in blood parameters were the result of a mixed acidosis containing metabolic and respiratory components.